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REMARKS

Claims 1 and 3-22 are pending in the present application. Claims 1 and 3-22 are rejected under 35 U.S.C. 103(a). Claims 1, 13, and 20 are amended. The rejections are respectfully traversed in light of the following remarks, and reconsideration is requested.

Rejections over Thompson (U.S. 5,037,174) in view of Okubo et al. (U.S. 5,565,978)

Claims 1, 6, 7, 10, and 11 were rejected. In rejecting claim 1, the Examiner states, in part, that "Thompson does not teach that the modifying comprises removing material from at least one end of the optical fiber member. Okubo teaches removing material from an optical fiber to form a lens tip at the end of a continuous taper (column 8, lines 13-24 and column 10, lines 23-30)."

Okubo teaches a refractive index sensor using total internal reflection of light beams. (See, e.g., col. 2, lines 33-36; Figs. 2(a), 3, 5, 6, 13, and 14). The sensor comprises one or more optical fibers 10 abutting a core glass 3. Light exiting the optical fiber(s) broadens or expands (as opposed to converging or focusing) in the core glass. (See, e.g., col. 6, lines 4-10 and 62-67, col. 8, lines 13-15, col. 8, line 65 to col. 9, line 2, col. 9, lines 16-18, 41-43, and 65-67, col. 10, lines 15-20; Figs. 2(a), 3, 5, 6, 13, and 14). Thus, Okubo clearly teaches a fiber that expands the exiting light. Okubo further teaches that the "expansion angle can be altered by working the end of the optical fiber, e.g., by melt processing or etching to a hemispherical lens or rounded-tip tapered shape."

In contrast, claim 1 has been amended to recite "applying energy to the modified end of the optical fiber member to form a lens surface with a desired focal length". Support for the amendment is found in Applicant's specification at paragraphs [0012] and [0037]. Thus, no new matter is added. As is clear from Applicant's specification and claims, the recited

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method enables a lens to be formed on an optical fiber by first removing material from the fiber to form a continuously tapered tip and then applying energy to the tip to form a lens with a desired focal length.

Thompson teaches quickly pulling apart a fiber, resulting in a separation into two fibers and the formation of a nipple-like extension at the ends of both fibers. The pulling action, along with exposure to an arc energy, results in the ends rounded into an aspherical shape. (Col. 4, lines 27-31, col. 4, lines 45-52, col. 4, line 63 to col. 5, line 35, col. 5, lines 41-55; Figs. 1, 2, 3A, and 3B). Okubo teaches altering an expansion angle of a fiber, where the altering, such as by melt processing or etching, completes the process.

There is no teaching in Thompson or Okubo of "applying energy to the modified end of the optical fiber member to form a lens surface with a desired focal length". Thompson is silent on this. Okubo teaches a broadening lens, which necessarily has no focal length. Accordingly, Applicant believes claim 1 is patentable over Thompson in view of Okubo.

Furthermore, Applicant contends that Thompson and Okubo cannot be combined to maintain a 103 rejection because there is no motivation to combine. The Examiner states that the motivation is to more accurately and economically control the modification. As discussed, Thompson discloses quickly pulling apart a fiber to form a nipple-like extension at the ends of both fibers. The pulling action, along with exposure to energy, results in the ends rounded into an aspherical shape. On the other hand, Okubo teaches altering the expansion angle, such as by etching, to form the lens. Thus, a combination with Thompson would simply result in the nipple-like extensions of Thompson being etched to form a lens. Applicant contends there is no motivation or reason to combine the two in any other way, due in part to the sequence of steps described in Thompson.

Consequently, because Applicant believes that Thompson cannot be properly

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combined with Okubo and/or that even if combined, would not teach the limitations of claim 1, claim 1 is patentable over Thompson in view of Okubo.

Claims 6, 7, 10, and 11 depend on claim 1 and are thus patentable over Thompson in view of Okubo for at least the same reasons as claim 1.

Rejections over Thompson in view of Okubo and Yamane et al. (U.S. 5,459,803)

Claims 3-5, 13-17, and 20 were rejected. Yamane is cited, inter alia, for "etching the at least one end of the optical fiber member". However, Yamane does not remedy the deficiencies of Thompson and Okubo as discussed above with respect to claim 1. Similarly, independent claims 13 and 20 are amended to recite "heating said tip to form a lens surface with a desired focal length, wherein the lens surface continuously tapers outward to the outer surface of the fiber" and "applying energy to the modified end of the optically transparent cylindrical fiber to form the first lens surface with a desired focal length", respectively, claims 13 and 20 are believed patentable over Thompson in view of Okubo and Yamane for reasons similar to claim 1.

The remaining claims are dependent on claims 1 and 13 and are therefore patentable for at least the same reasons as claims 1 and 13.

Applicant also contends that the obviousness rejection under 35 U.S.C. § 103 cannot be established by combining the teachings of Thompson and Okubo with Yamane et al. because there is no suggestion or motivation in the cited references for the combination.

Yamane discloses an optical fiber 10 comprising "a core 11 made of a quartz-based glass and a clad 12 made of another quartz-based glass which surrounds the core." (Yamane, col. 5, lines 12-14; Fig. 4). As shown in Figs. 4-8 and 10-14, the optical fiber has an end surface that is "flat and perpendicular" to the axial direction of the fiber. (Yamane, col. 5,

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lines 19-29, col. 6, lines 4-9, col. 7, lines 54-59, col. 8, lines 23-27, 33-35, and 39-43, and col. 9, lines 19-30). In other words, the optical fiber of Yamane has a significant clad portion, all of which is flat at the end of the fiber. A key objective in Yamane is having an "optical fiber with a lens which is free of any tapered portion". (Yamane, col. 3, lines 26-28 and col. 6, lines 4-8). At the middle of the fiber, the core 11 projects out from the flat portion of the clad that is either a curved or rounded shape as shown in Figs. 4-7 and 10-14, a truncated cone shape as shown in Fig. 8, or a conical shape as shown in Fig. 14. Thus, Yamane discloses a quartz-based optical fiber having a central core portion that is shaped (round, truncated cone, or conical) and an outer clad portion that is flat. Etching using HF acid provides a slower etching speed in the core portion than in the clad portion of the quartz-based glass specialty fiber "to form a projecting core of a truncated cone shape on the end surface". (Yamane, col. 4, lines 14-18 and col. 8, lines 28-35) (emphasis added). Thus, the etching of Yamane is to form a flattened portion on the end surface.

On the other hand, Thompson, as discussed above, is directed to forming an optical fiber having a nipple-like extension, which is then rounded into an aspherical shape using arc energy. (See, e.g., Thompson, col. 5, lines 21-55; Fig. 2). At no point in the fiber formation does the fiber have a truncated cone shape or a flattened shape.

Applicant, thereby, contends that there is no suggestion or incentive to combine Thompson and Yamane because Thompson and Yamane are directed to very different processes for forming a lens on an optical fiber, as outlined above. Also, in the present case, there is not suggestion of the desirability of a combination of Thompson and Yamane because, as mentioned above, Thompson and Yamane use different processes to achieve different types of lens shapes, i.e., aspherical versus truncated cone. Etching of Yamane is to create a truncated cone shape; the pulling and heating of Thompson is to create a nipple-like

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extension and an aspherical shape, respectively, at the end of the fiber. As such, there would be no reason to etch the fiber using HF acid. Applicant would not even know how to modify the process of Thompson to use HF acid to etch the fiber, as the invention of Thompson is to first pull and separate a fiber into two parts to create a nipple-like extension at the two ends and to then expose the ends to arc energy to smooth out the extension and form an aspherical lens surface. Accordingly, Thompson does not suggest to one skilled in the art the desirability to combine with Yamane, and in fact, may not even make it possible to practice the invention of Thompson if the combination with Yamane is actually practiced.

Consequently, Applicant believes claims 3-5, 13-17, and 20 are patentable over Thompson and Okubo in view of Yamane because the combination of Thompson, Okubo, and Yamane is improper and even if properly combined, does not render the claims obvious as discussed above.

Rejections over Thompson in view of Okubo and Cesaroni (U.S. Pub. 2003/0029040)

Claims 8 and 9 were rejected. Cesaroni is cited for disclosing removing and heating material both ends of the fiber, but does not teach removing material from the fiber to form continuously tapered ends and then applying heat to form a continuously tapered lens surface. Because Cesaroni does not remedy the deficiencies of Thompson and Okubo as discussed above with respect to claim 1, claims 8 and 9, which depend on claim 1, are patentable over Thompson and Okubo in view of Cesaroni.

Rejection over Thompson in view of Okubo and Grasso III et al. (U.S. 6,375,651)

Claim 12 was rejected. Grasso, III et al. was cited for disclosing moving the modified end of the fiber to a spark. However, Grasso, III et al. does not remedy the deficiencies of

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Thompson and Okubo as applied to claim 1 and discussed above. Therefore, because claim 12 depends on claim 1, claim 12 is patentable over Thompson and Okubo in view of Grasso, III et al.

Rejections over Thompson in view of Okubo, Yamane, and Cesaroni

Claims 18 and 19 were rejected. Claims 18 and 19 depend on claim 13. As discussed above, claim 13 is believed patentable over Thompson and Okubo in view of Yamane. Cesaroni is cited for disclosing removing and heating material both ends of the fiber, but does not remedy the deficiencies of Thompson, Okubo, and Yamane. Therefore, claims 18 and 19 are patentable over the cited references.

Rejections over Thompson in view of Okubo, Yamane, and Wei et al. (U.S. Pub. 2004/0134884)

Claims 21 and 22 were rejected. Wei et al. is cited for disclosing oil placed on the top surface of an etching liquid. Wei et al. discloses coating a fiber with a "relatively thick coating layer 330" and then immersing the end of the fiber into an HF solution to form a tip of a probe. (Wei, paragraphs [0022] to [0025]; Figs. 3A-3C). However, Wei et al. do not remedy the deficiencies of Thompson, Okubo, and Yamane as applied to claims 1 and 13 discussed above..

Therefore, because claims 21 and 22 depend on claims 1 and 13, respectively, claims 21 and 22 are patentable over the cited references.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections of the claims 1 and 3-22 under 35 U.S.C. § 103(a).

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CONCLUSION

For the foregoing reasons, Applicant believes pending claims 1 and 3-22 are allowable, and a notice of allowance is respectfully requested. If the Examiner has any questions regarding the application, the Examiner is invited to call the undersigned Attorney at (949) 752-7040.

Certification of Facsimile Transmission
I hereby certify that this paper is being facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Sandy Kim — September 7, 2007 Date of Signature

Respectfully submitted,

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